

A NEW method of illumination for photographic work, particularly for enlarging and for projection purposes where great magnification is not required, has been brought under our notice. The apparatus is known as the "Petrolite" photographic lamp, and is sold by Mr. A. J. Garrad, of 317 High Holborn, W.C. The lamp consists essentially of an ordinary Welsbach incandescent gas-mantle, which is raised to a condition of incandescence by the use of petrol gas. The petrol is contained in a metal chamber, but is all taken up by a highly absorbent material; consequently there is no loose petrol in the container. Once it is absorbed it does not escape, but is only given up again in the form of vapour as it is required at the burner. If from any cause the apparatus is overturned, the light goes out. The whole appliance will go inside an ordinary lantern body, and is obviously a good arrangement where either ordinary gas or any method of electrical illumination is unobtainable. The price is reasonable, and the cost of running is lower than that of any other similar method of incandescent gas lighting. The apparatus may be commended to those who require a source of light that must be independent of any extraneous supply of gas or electricity.

WE have received from the Bausch and Lomb Optical Co., of 9 Thavies Inn, Holborn Circus, E.C., its latest catalogue of microscopes, apparatus for photomicrography, and various projection appliances. From it we gather that the Bausch and Lomb Co. is now acting in close cooperation with Messrs. Carl Zeiss, of Jena, and that many of its products are based on the investigations carried out by the latter firm. The apparatus for photomicrography appears to be now of a very complete order, and is in general design much the same as that made by Messrs. Zeiss, the camera and the portion of the apparatus supporting the microscope and optical accessories being regarded as two separate appliances. While this is what some regard as an objection, the whole apparatus not being fastened to one single solid base, yet, on the other hand, it ensures that any movement of either component is not communicated to the other part. The apparatus for the projection of both opaque and transparent objects is of new design, and appears to be built in a very substantial way, and is arranged to carry out work of almost any description in this direction. As the Bausch and Lomb Co. is now fitting up new showrooms in London, where all these appliances may be seen under working conditions, a visit at the present time cannot fail to be of interest to those who contemplate purchasing such apparatus.

THE Colorado School of Mines Quarterly for April is wholly devoted to a short monograph on tungsten, by H. R. Van Wagener. The first part, which is more of local interest, gives an account of the Colorado mines and mill practice. The second part deals with the physical properties and uses of tungsten, its mineralogy, chemistry, and metallurgy. The preparation and properties of the tungsten alloys are also described, and at the conclusion of the paper there is a useful bibliography. The main applications of tungsten are found in the preparation of various tungsten steels and of metallic filaments for lamps, other uses being found for tungstates as a mordant in dyeing, in the preparation of non-inflammable fabrics, and as a pigment.

ATTENTION has been directed more than once to the growth in size, year by year, of the "Statesman's Year-book," published by Messrs. Macmillan and Co., Ltd.,

and edited by Dr. J. Scott Keltie with Mr. I. P. A. Renwick's assistance. The 1909 issue, which is now available, represents a successful attempt to reduce the bulk, without affecting the usefulness, of this valuable statistical and historical annual. This satisfactory reduction by some 300 pages has been accomplished by the introduction of uniform type, the elimination of superfluities, economies of space, and various re-arrangements. The present issue has several new features; some deal with recent changes in the altered constitutional character of several countries, others with new census returns and various other matters of public interest, while a new section gives a brief statement with reference to the Hague Tribunal, with a list of members. The plates, which are all new, include a diagram exhibiting British and German naval expenditure on new construction during the last decade; and maps illustrating the Anglo-Siamese Treaty, 1909; the Anglo-Abyssinian Boundary, 1902 and 1907; the Anglo-German and German-French Kamerun Boundary, 1906 and 1908; the All Red Route; and the military divisions of India. The price of the year-book remains 10s. 6d. net.

ERRATUM.—Mr. Hy. Harries informs us that on p. 403 of NATURE of June 3 the ship on which Dr. von Neumayer returned from Melbourne in 1864 was erroneously given by him as the *Sovereign of the Seas*; it should have been the *Garrawald*.

OUR ASTRONOMICAL COLUMN.

THE RINGS OF SATURN.—Prof. Levi-Civito has written an interesting pamphlet on the mechanics of the ring of Saturn ("Sulla Forma dell' Anello di Saturno," Premiale Officine Grafiche Carlo Ferrari, Venezia). His conclusion is that under certain hypotheses the angular velocity of each ring exceeds that of a satellite at the same distance. He points out that the differential equations applicable to a flexible substance are applicable, even in spite of Clerk Maxwell's demonstration that the ring consists of discreet particles. He therefore reverses the procedure of Stazio in Dante:—

"Trattando l'ombra come cosa salda."

CHANGES IN THE FIGURE AND DIMENSIONS OF THE SUN.—In a mathematical paper appearing in No. 4, vol. xxix., of the *Astrophysical Journal* (p. 257, May), Prof. Moulton discusses the possibility of observing changes in the form and dimensions of the sun from the dynamical point of view.

After reviewing briefly the practical methods previously employed to detect any possible variation, he attacks the problem from various theoretical standpoints, with reasonable assumptions, and arrives at several interesting conclusions. First, he shows that the difference between the equatorial and polar diameters must be less than 0.07" as seen from the earth, and is, therefore, beyond observation by any means yet employed. Then, considering possible oscillations, he demonstrates that, if they exist in the sun, their period cannot exceed a few hours, although different periods might combine to form "beats."

It seems possible, at first glance, that any possible shrinking might be demonstrated by the change in the rate of rotation before becoming directly measurable from the earth, but Prof. Moulton shows that this is unlikely. Variations of diameter would presumably produce corresponding variations of temperature, but it is surprising to find that a variation of the apparent diameter by 0.1" should produce a change of 1400° C. in the temperature. Considering the effect of such dilatational oscillations on the power of radiation, it is shown that, were the diameter undergoing changes amounting to 0.1", as seen from the earth, the rate of radiation at maximum would be 2.56 times that at minimum radius; in other words, the variation would be about one stellar magnitude. Langley and Abbot believed they had observational evidence of a 10 per cent. variation in the radiation, but this would correspond

to a variation of only 0.01" in the apparent diameter, an unmeasurable quantity.

CAMERA OBJECTIVES FOR SPECTROGRAPHS.—No. 4, vol. xxix., of the *Astrophysical Journal* contains an interesting practical paper, by Mr. Plaskett, of the Dominion Observatory, Ottawa, describing a large number of tests he has carried out whilst endeavouring to find the most universally useful form of objective for spectrographic work.

A number of tests were made by Hartmann's extra-focal image method adapted to spectrographic work, and the results are given in detail and illustrated by diagrams. For a dispersion of three prisms with a camera of fairly long focus, it was found that, of the objectives tested, the Zeiss "Chromat" and the Brashear Light Crown were the best. The former gives a flatter field and slightly better definition, but for the latter there is the advantage that the plate has to be inclined only 8° instead of 16°, and the absorption is less. For short-focus work the Zeiss Tessar and the Ross Special Homocentric gave good definition and flat fields.

THE ASTROGRAPHIC CONFERENCE AT PARIS.

THE permanent committee of the Astrographic Congress of 1887, as our readers are aware, recently held its fifth meeting at Paris. Invitations were by no means confined, however, to members of that committee, and they were largely accepted by other astronomers. The following were present, representing observatories cooperating in the work:—

Algeria: Gonnessiat; Belgium: Lecointe; Bordeaux: Picard and Kromm; Cape of Good Hope: Hough; Catania: Ricco; Greenwich: Cowell; Helsingfors: Donner; Oxford: Turner; Paris: Baillaud; Perth (W. Australia): Cooke; Potsdam: Scheiner; Rome: Lias; San Fernando: Azcarate; Tacubaya: Valle, Gallo; Toulouse: Cosserat, Montagerand; Sydney and Cordoba were not represented, owing to the recent deaths of their respective directors.

The following astronomers and others were also present:—

America: Hale, Leuschner, Perrine, Ritchey; Austria: Palisa; Belgium: Delvosal; Denmark: Strömgren; France: Andoyer, André, Angot, Bayet, Benoit, Prince Roland Bonaparte, Bouquet de la Grye, Bourget, de la Baume Pluvinel, Carpentier, Darboux, Deslandres, Fontana, Fournier, Gaillot, Gautier, F. Hanusse, Hatt, Lagarde, Lallemand, Lippmann, Lumière, Verschaffel; Paris Observatory: Baillaud, J., Bigourdan, Bouquet de la Grye, Hamy, Leveau, Puiseux, Renan; Germany: Hartwig, Kustner, Zurhellen; Great Britain: Dyson, Franklin-Adams, Sir David Gill, Hinks, Knobel, Major MacMahon; Holland: Bakhuizen, Kapteyn; Italy: Boccardi; Russia: Backlund.

The conference assembled at the observatory at 10 a.m. on Monday, April 19. For nearly an hour the members were occupied in mutual greetings, introductions, and general conversation. The chair was then taken by M. Charles Bayet, Conseiller d'Etat, Directeur de l'Enseignement supérieur au Ministère de l'Instruction publique et des Beaux Arts, who delivered an address, bidding the members welcome in the most cordial terms, and expressing on the part of his Government and of the Republic their interest in and sympathy with the great work to promote which so many astronomers had now assembled from all parts of the world. M. Baillaud, director of the Paris Observatory, then delivered an admirable address. He thanked the assembly for the honour done him by electing him unanimously as their president so soon after his appointment as director of the Paris Observatory. He briefly traced the history of the undertaking known as the "Carte du Ciel," which had its origin in 1887. He referred in touching terms to Admiral Mouchez, to whom the "Carte du Ciel" owed in a great degree its successful origin; to Tisserand, whose classic labours so adorned the science that he loved; and to Lœwy, who had done so much, not only to develop the Paris Observatory, but to extend the scope and usefulness of the work of the "Carte du Ciel." He described the great share which

Lœwy had taken in collecting, discussing, and printing the observations of Eros in 1900, which, in the hands of Mr. Hinks, had led to a very accurate determination of the solar parallax. He showed that by undertaking these observations, not only had thus a most important result been arrived at, but by the refined discussion of the observations of Eros some important systematic errors in photographic observation had been detected, and the sources of these errors found. We had, in fact, by this extension of our field of work, not only arrived at important new results, but greatly improved the results of our previous labours.

But much yet remained. We had now, for example, to study the problems of perfecting the systematic corrections applicable to the preliminary determinations of magnitude and position of all the catalogue stars, so that when the work of the different zones had been completed the final catalogue should present a harmonious whole. It was also necessary that we should make preparation for the regular observation of Eros in future, and begin to consider what should be done in order to take the fullest advantage of the extraordinarily favourable opposition of that planet in 1931. Everything that we did to improve the work of the catalogue would go towards perfecting the determination of the places of the comparison stars to be observed with Eros from now until 1931, and the necessary striving after systematic accuracy which must result from such researches must react in the way of improving the fundaments of sidereal astronomy.

Such, at least, are the writer's recollections (without notes) of this admirable and inspiring address, after the delivery of which M. Baillaud, in a few graceful words, proposed the election of Sir David Gill as "Président d'Honneur," a proposal which was carried by acclamation.

The bureau of the general assembly was then constituted as follows:—*vice-presidents*, Bakhuizen, Backlund, Kapteyn; *secretaries*, Donner, Puiseux, Scheiner, Turner.

A suggested programme for the work of the meeting had been prepared by Sir David Gill, and was circulated by the president, M. Baillaud, in January last. This programme was accepted by the meeting, and, in accordance with it, the president formally presented two volumes, one marked A, containing advance proofs of the printed reports of the progress of the work of the chart and catalogue at the different cooperating observatories, and another, also in proof, marked B, containing papers and discussions of very great interest, such, for example, as Hinks's report on his great discussion of the Eros observations, Campbell's report on Perrine's discussion of the Eros observations made at the Lick Observatory, Hough's paper on a proposed method for the *raccordement* of astrographic plates, E. C. Pickering's report on a standard scale of photographic magnitudes, and other papers on kindred subjects by J. Baillaud, Pourreau, Cohn, and Millozovich.

Then, in accordance with the programme, the conference was divided into five commissions, viz.:—

(A) To report on the state of the work and the steps to be taken to perfect or accelerate the work.

(B) To report on the method to be adopted for the conversion of measured diameters of star-discs (or magnitudes, as estimated at the different observatories) into an exact and uniform system of magnitudes.

(C) To report on the existence and probable origin of systematic errors in the measured coordinates of star-discs on certain plates, on the best methods for avoiding such errors in the future, and of putting in evidence and eliminating their effects in the plates already measured.

(D) *The Catalogue Committee.*—To examine the origin of the star-positions employed in the preliminary reduction of the plates of each zone, to study the best means of coordinating the star-places of the different zones, and to determine the systematic corrections necessary to reduce the whole to a uniform and absolute system.

(E) *The Eros Committee.*—(1) To report on the steps to be taken for the preparation of a preliminary ephemeris of Eros at its opposition in 1931 of sufficient precision to permit the early selection of comparison stars. (2) To propose means for the regular observation of the planet from the present time onwards in order to perfect the ephemeris which will be finally employed for the definitive